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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/929,350 | 08/15/2001 | Jerome M. Eldridge | M4065.0454/P454 | 8862 |

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EXAMINER

CHU, CHRIS C

| ART UNIT | PAPER NUMBER |
|----------|--------------|
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2815

DATE MAILED: 02/09/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/929,350

Applicant(s)

ELDRIDGE ET AL.

Examiner

Chris C. Chu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 November 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 - 183 is/are pending in the application.
- 4a) Of the above claim(s) 1-36,45-59,61,73-87,118,129 and 132-183 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 37 - 44, 60, 62 - 65, 68 - 72, 88 - 102, 105 - 117, 119 - 124, 127, 128, 130 and 131 is/are rejected.
- 7) ☒ Claim(s) 66,67,103,104,125 and 126 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date <u>8</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Request for Continued Examination

1. A request for continued examination (RCE) under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on November 12, 2003 has been entered. An action on the RCE follows.

Response to Amendment

2. Applicant's amendment filed on November 12, 2003 has been received and entered in the case.

Election/Restrictions

3. Claims 1 – 36, 45 – 59, 61, 73 – 87, 118, 129 and 132 – 183 continue to be withdrawn from consideration for the reasons provided in the Office action mailed on December 17, 2002.

Information Disclosure Statement

4. The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609 A(1) states, "the list may not be

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incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered (e.g., U.S. Pat. No. 6,121,131 in page 12 of specification).

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 37 – 40, 43, 44, 60, 62 – 65, 70, 71, 72, 88 – 91, 94, 95, 98 – 102, 107, 108, 111 – 115, 119 – 124, 130 and 131 are rejected under 35 U.S.C. 102(b) as being anticipated by Stupian et al. '364.

Regarding claim 37, Stupian et al. discloses in e.g., Fig. 1 and column 4, line 55 – column 5, line 10 a semiconductor package comprising:

- a hermetically sealed enclosure (10, 12 and column 4, line 67) surrounding said package (14);
- a semiconductor chip (14) within said enclosure;
- a first gas (any material in air which reads as first gas) within said enclosure; and
- a thin layer (16a) deposited over at least part of or partially covering said semiconductor chip comprising a source of releasable hydrogen (column 5, lines 1 - 10) within said enclosure.

The hydrogen released from the bonding material is “capable of pressurizing the space within said enclosure to a pressure above the pressure associated with said first gas.” Whether the package is, in fact, pressurized is immaterial as this is intended use language, and it has been held that the recitation that an element is “capable of” performing a function is not a positive limitation but only requires the ability to so perform. In re Hutchison, 69 USPQ 138.

Regarding claims 38, 63, 89, 100, 113 and 122, since Stupian et al. discloses in e.g., Fig. 1 air in space (between 10 and 12), said first gas comprises helium.

Regarding claims 39, 64, 90, 101, 114 and 123, since Stupian et al. discloses in e.g., Fig. 1 air in space (between 10 and 12), said first gas comprises hydrogen.

Regarding claims 40, 65, 91, 102, 115 and 124, since Stupian et al. discloses in e.g., Fig. 1 air in space (between 10 and 12), said first gas comprises a mixture of helium and hydrogen.

Regarding claims 43 and 70, Stupian et al. discloses in e.g., Fig. 1 and column 4, line 55 – column 5, line 10 said package further comprising at least one heat source (any one of circuit traces in the element 14) for heating the source of releasable hydrogen so as to effect the release of hydrogen.

Regarding claims 44 and 71, Bloom discloses in Fig. 4 said package further comprising a plurality of heat sources (circuit traces in the element 14) for heating the source of releasable hydrogen so as to effect the release of hydrogen.

Regarding claim 60, Bloom discloses in Fig. 4 further comprising a substrate (10), wherein said chip is attached to the substrate. Further, as to the language on line 2 of claim 60, the phrase “with a controlled collapse chip connection” is product-by-process claim language. Even though product-by-process claim is limited by and defined by the process, determination of

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patentability is based upon the product itself. The patentability of a product does not depend on its method of production. If the product in product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product is made by a different process. In re Thorpe, 227 USPQ 964, 966 (Fed. Cir. 1985) (citations omitted). A “product by process” claim is directed to the product per se, no matter how actually made, In re Hirao, 190 USPQ 15 at 17 (footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Fessmann, 180 USPQ 324; In re Avery, 186 USPQ 116; In re Wertheim, 191 USPQ 90 (209 USPQ 254 does not deal with this issue); and In re Marosi et al., 218 USPQ 289 final product per se which must be determined in a “product by, all of” claim, and not the patentability of the process, and that an old or obvious product, whether claimed in “product by process” claims or not. Note that Applicant has the burden of proof in such cases, as the above caselaw makes clear.

Regarding claim 62, Stupian et al. discloses in e.g., Fig. 1 and column 4, line 55 – column 5, line 10 a semiconductor package comprising:

- a hermetically sealed enclosure (10 and 12) surrounding said package;
- a semiconductor chip (14) within said enclosure;
- a heat-activated source of releasable hydrogen (16a) within said enclosure; and
- a gas (any material in air which reads as first gas) at an elevated pressure within said enclosure,
- said gas comprising a first gas component and a second gas component, wherein said second gas component results from the release of said releasable hydrogen upon application of heat, and wherein said first gas component is initially present within

said enclosure prior to the release of said releasable hydrogen, and said first gas component is initially present at a pressure lower than said elevated pressure.

Regarding claim 72, since Stupian et al. discloses in e.g., Fig. 1 air in space (between 10 and 12), said gas having a pressure of from “about” 5 Mpa.

Regarding claim 88, Stupian et al. discloses in e.g., Fig. 1 and column 4, line 55 – column 5, line 10 a semiconductor chip comprising:

- a hermetically sealed enclosure (10 and 12) surrounding said chip;
- an integrated circuit (14) within said enclosure;
- a gas (any material in air which reads as first gas) at a first pressure within said enclosure; and
- a thin layer (16a) deposited over at least part of or partially covering said semiconductor chip comprising a source of releasable hydrogen (column 5, lines 1 - 10) within said enclosure.

The hydrogen released from the bonding material is “capable of pressurizing the space within said enclosure to a pressure above the pressure associated with said first gas.” Whether the package is, in fact, pressurized is immaterial as this is intended use language, and it has been held that the recitation that an element is “capable of” performing a function is not a positive limitation but only requires the ability to so perform. In re Hutchison, 69 USPQ 138.

Regarding claims 94, 107, 119 and 130, Stupian et al. discloses in e.g., Fig. 1 and column 4, line 55 – column 5, line 10 said chip further comprising at least one heat source (any one of circuit traces in the element 14) for heating the source of releasable hydrogen so as to effect the release of hydrogen.

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Regarding claims 95 and 108, Stupian et al. discloses in e.g., Fig. 1 and column 4, line 55 – column 5, line 10 said chip further comprising a plurality of heat sources (circuit traces in the element 14) for heating the source of releasable hydrogen so as to effect the release of hydrogen.

Regarding claims 98, 111, 120 and 131, Stupian et al. discloses in e.g., Fig. 1 and column 4, line 55 – column 5, line 10 further comprising a heater (any components, e.g., pad, in the element 14) and associated heater circuitry (circuit traces).

Regarding claim 99, Stupian et al. discloses in e.g., Fig. 1 and column 4, line 55 – column 5, line 10 a semiconductor chip comprising:

- a hermetically sealed enclosure (10 and 12) surrounding said chip;
- an integrated circuit (14) within said enclosure;
- a heat-activated source of releasable hydrogen (16a) within said enclosure; and
- a gas (any material in air which reads as first gas) at an elevated pressure within said enclosure,
- said gas comprising a first gas component and a second gas component, wherein said second gas component results from the release of said releasable hydrogen upon application of heat, and wherein said first gas component is initially present within said enclosure prior to the release of said releasable hydrogen, and said first gas component is initially present at a pressure lower than said elevated pressure.

Regarding claim 112, Stupian et al. discloses in e.g., Fig. 1 and column 4, line 55 – column 5, line 10 a semiconductor chip comprising:

- a hermetically sealed enclosure (10 and 12) surrounding said chip;

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- a gas (any material in air which reads as first gas) at a first pressure within said enclosure; and
- a source of releasable hydrogen (16a) within said enclosure.

The hydrogen released from the bonding material is “capable of pressurizing the space within said enclosure to a pressure above the pressure associated with said first gas.” Whether the package is, in fact, pressurized is immaterial as this is intended use language, and it has been held that the recitation that an element is “capable of” performing a function is not a positive limitation but only requires the ability to so perform. In re Hutchison, 69 USPQ 138.

Regarding claim 121, Stupian et al. discloses in e.g., Fig. 1 and column 4, line 55 – column 5, line 10 a semiconductor chip comprising:

- a hermetically sealed enclosure (10 and 12) surrounding said chip;
- a heat-activated source of releasable hydrogen (16a) within said enclosure; and
- a gas (any material in air which reads as first gas) at an elevated pressure within said enclosure,
- said gas comprising a first gas component and a second gas component, wherein said second gas component results from the release of said releasable hydrogen upon application of heat, and wherein said first gas component is initially present within said enclosure prior to the release of said releasable hydrogen, and said first gas component is initially present at a pressure lower than said elevated pressure.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 41, 42, 68, 69, 92, 93, 96, 97, 105, 106, 109, 110, 116, 117, 127 and 128, are rejected under 35 U.S.C. 103(a) as being unpatentable over Stupian et al. in view of Babcock et al. '634.

Stupian et al. discloses the claimed invention except for said source of releasable hydrogen being titanium hydride. However, Babcock et al. teaches in column 1, lines 11 – 22 a source of releasable hydrogen being titanium hydride. Thus, it would have been obvious to one of ordinary skill in the art at the time when the invention was made to modify Stupian et al. by substituting the titanium hydride at the place of source of releasable hydrogen material of Stupian et al. as taught by Babcock et al. The ordinary artisan would have been motivated to modify Stupian et al. in the manner described above for at least the purpose of increasing bond strength between the chip and board by satisfactorily wet both members (column 1, line 13).

Allowable Subject Matter

9. Claims 66, 67, 103, 104, 125 and 126 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 66, 67, 103, 104, 125 and 126 contain allowable subject matter because none of references of record teach or suggest, either singularly or in combination, at least the limitation of gas comprising helium and from about 5% to about 10% hydrogen.

Response to Arguments

10. Applicant's arguments with respect to claims 37, 62, 88, 99, 112 and 121 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kamijo et al. and Aikiyo disclose a releasable hydrogen layer in a semiconductor package.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chris C. Chu whose telephone number is (703) 305-6194. The examiner can normally be reached on M-F (10:30 - 7:00).

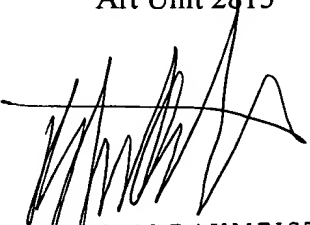
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chris C. Chu
Examiner
Art Unit 2815

c.c.
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B. WILLIAM BAUMEISTER
PRIMARY EXAMINER